

Serial No 10/675,784
Filed 9/30/2003
Examiner Christopher Shin

Office Action Response
January 9, 2006
Group Art Unit 2182

Remarks

This amendment is filed in response to an Office Action mailed 9/9/2005 ("Office Action"). In this Office Action, Claims 1-32 were rejected. Claims 1-32 remain pending. In the amendment set forth above, Claims 1, 2, 4-6, 8, 10, 14, 24, and 31 are amended, and the remaining Claims are as previously presented. In view of the amendments to the Claims and the comments set forth below, it is submitted that all Claims are in condition for allowance.

1. Claims 1-32 were rejected under 35 USC §102(e) as being anticipated by U.S. Patent Application US2003/0145210 to Taylor ("Taylor"). This rejection is respectfully traversed.

As currently amended, Claim 1 describes a method for allowing a request that is any one of multiple request types to gain access to a resource. According to the method, multiple thresholds are defined. Each threshold is associated with one or more of the request types, and at least one of the request types is associated with multiple thresholds. (Claim 1 step b.)

The aspect of the invention described above is shown in Applicants' Figure 3. In that figure, request types are shown as "X, Y, and Z". These requests may comprise read requests, write requests, and high-priority read requests, for instance. As may be noted, it is possible to define a threshold that is associated with multiple request types, as is claimed by Applicants' Claim 1. For instance, threshold 1 of Figure 3 is associated with request types X, Y and Z. Conversely, it is possible to associate a request type with multiple thresholds, as is also claimed by Applicants' Claim 1, as amended. For instance, in Figure 3, request type X is associated with all of thresholds 1, 2, and 3. This provides a very flexible mechanism for controlling the types of requests that gain access to a resource. For instance, even after Threshold 1 has been exceeded, some of the requests that are of a type associated with that threshold may still gain access to the resource if the type is associated with a different threshold.

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Next, Taylor is considered. The Examiner states that the Taylor shared resources 24a – 24n teach Applicants' shared resource, and the Taylor read and write requests teach Applicants' request types. (Taylor page 3, lines 4-6.) The Examiner further states that Applicants' threshold values are taught by the numbers of requests that are limited and utilized by elements 50, 70, 72, 90, and 110. (Taylor page 3 lines 7-9.) This last statement is not completely understood.

As best understood from Taylor, the number of read requests that may gain access to a shared resource is controlled by the allowed readers field 96 of Taylor Figure 3 as follows:

"As allowed readers field 96 indicates a maximum number of processes/threads that can be simultaneously granted read access to the shared resource 24a, 24b,...24n". (Taylor paragraph 0029.)

From this paragraph, the allowed readers field 96 limits the number of read requests to a resource, and thus it would appear the Examiner is citing this field as teaching a threshold for controlling the number of read requests that gain access to a shared resource. If this understanding is not correct, and this rejection is maintained, clarification is requested.

In regards to write requests, only a single write request can gain access to a shared resource at a given time, as described in Taylor paragraph 34 (see, in particular, lines 17-22 of this paragraph.) Thus, it appears that "a threshold" associated with write requests is always set to "one". If this understanding is not correct, and this rejection is maintained, clarification is requested.

An additional I/O request list 54 is maintained to record those processors or thresholds queued to perform a read or write operation to a shared resource. (Taylor paragraph 25.) Taylor does not appear to set any limit (or threshold) on the number of pending requests in this list.

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For completeness, it may be noted that the Examiner appears to find significance in the "numbers of requests that are limited and utilized by elements 50, 70, 72, 90, and 110". However, if the Examiner's analogy is followed such that the Taylor shared resources 24a – 24n teach Applicants' shared resource, then any thresholds that teach Applicants' thresholds must control access to the Taylor shared resources, as required by Applicants' Claim 1 step d., both as originally provided and as currently amended. Therefore, any relevance as to the number of requests that are accessing the other elements 50, 70, 72, 90, and 110 besides the shared resources 24 within the Taylor system is not understood. If this rejection is maintained, more clarification is requested regarding the significance of "the number of requests limited and utilized by elements 50, 70, 72, 90 and 110".

Next, the differences between Applicants' Claim 1 and the teachings of Taylor are considered.

1. Applicants' Claim 1, as amended describes at least one of the request types as being associated with multiple thresholds. (Claim 1 step b.) For instance, in Applicants' Figure 3, request type "X" is associated with Thresholds 1-3. This capability is not taught by Taylor. In Taylor, read requests are associated with a "read threshold" defined by the allowed readers field 96. Any write requests are associated with what might loosely be termed a "write threshold" that is always set to "one" by virtue of the fact that only one request can gain write access to a shared resource at once. The Taylor system does not have the flexibility to allow a request type (e.g., "read" or "write") to be associated with multiple thresholds as is described by Applicants' amended Claim 1.

2. In addition to the foregoing, in Taylor, there is no step of defining multiple thresholds. A read threshold is set by the allowed readers field 96. However, the write threshold is not "defined", since it must always be set to "one". Therefore, Taylor does not teach defining multiple thresholds.

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For at least the foregoing reasons, Taylor does not teach each and every element of Claim 1 as currently amended, and this rejection should be withdrawn.

Claims 2 – 13 depend from Claim 1 and are allowable over this rejection for at least the reasons set forth in regards to Claim 1. These Claims include additional aspects not taught by Taylor as follows:

Claim 3 describes tracking a requester that issued a request after a determination is made that the request must be retried. In contrast to Applicants' system, Taylor merely returns a retry message to a process if a request must be retried, but does not track which processes have received such messages. For example, in regards to Taylor Figure 4:

"...a retry message is returned (at block 204) to the calling process/thread to cause the calling process/thread to retry the request later." (Taylor Paragraph 31.)

Taylor does not describe any mechanism for maintaining a record of which processes and/or threads have received retry messages. For instance, an entry for the thread that received a retry message remains on the I/O request list 54 but this list does not appear to maintain any record of the issuance of the message to the thread. For this additional reason, Claim 3 is allowable over this rejection.

Claims 4–8 depend from Claim 3, and describe additional aspects of Applicants' system related to tracking which requesters have issued requests that must be retried as follows.

Claim 4 describes allowing a request from such a tracked requester to gain access to the resource even if a threshold has been reached. This is not taught by Taylor, which describes handling all requesters represented on the I/O request list 54 without any regard to whether they have previously received a

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retry message. (See, for example, Taylor paragraph 36.) In other words, when a Taylor process retries its request again, the process may, or may not, gain access to the requested resource. However, the process does not receive any elevated status to allow it to gain access to the resource regardless of whether an applicable threshold has been reached. For this additional reason, Claim 4 is allowable over this rejection.

Claim 5 depends from Claim 4 and describes the aspect wherein a requester that is being tracked will no longer be tracked after gaining access to the resource. Taylor does not teach this aspect of the invention, and Claim 5 is allowable over this rejection for these additional reasons.

Claim 6 depends from Claim 4 and recites creating a partition that includes one or more requesters. A request from a tracked requester is only allowed to gain access to a resource if that tracked requester is included within the partition. (See, for example, Applicants' Specification page 32 lines 20-25.) Nothing in Taylor describes the use of partitions, and selectively allowing requests to a resource based on those partitions. For this additional reason, Claim 6 is allowable over this rejection.

Claim 7 depends from Claim 6 and is allowable over this rejection for at least the reasons discussed in regards to Claims 1, 4, and 6.

Claim 8 depends from Claim 4 and further describes utilizing a predetermined priority scheme to select a request from among those submitted from tracked requesters. As discussed above in regards to Claim 4, Taylor does not track requesters, and therefore does not teach this additional aspect of the invention.

Claim 9 describes retrying the request only if the request is of one or more predetermined request types. In contrast, in Taylor, all request types (i.e., both read and write requests) are retried. For this additional reason, this Claim is allowable over this rejection.

Claim 10 includes allowing a request to gain access to a resource for purposes of allowing the request to be retried. This relates to the aspect of

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Applicants' invention wherein the shared resource is the TTQ 204 of Applicants' Figure 2, and a request must gain access to an entry within the TTQ to be retried. (See Applicants' Specification page 35.) In contrast, in Taylor, a request that is retried does not gain access to a shared resource. (See, for example, Taylor paragraph 31 lines 11-16.) For this additional reason, Claim 10 is allowable over this rejection, which should be withdrawn.

Claim 11 describes that defining the multiple thresholds is programmable. In Taylor, there is no defining of *multiple* thresholds, as discussed in regards to Claim 1. Moreover, the write threshold is implicitly always set to "one" (since only one write request may be occurring at once. Thus, there is no way to program this threshold. Moreover, there appears to be no discussion regarding the ability to program the "allowed readers field 96" of Taylor Figure 3. Thus, this additional aspect of Applicants' invention related to programming thresholds is not taught by Taylor.

Claim 12 describes programmably associating each threshold with one or more of the request types. This is accomplished, for instance, using storage devices 322, 324, and 326 of Figure 3, as described on page 21 lines 12-21 of Applicants' Specification. Thus, for instance, a "Threshold 1", can be programmably associated with request types X, Y and Z, as shown in Figure 3. This type of programmable capability is not taught by Taylor. In other words, in Taylor, the threshold that is determined by the allowed readers field 96 of Taylor Figure 3 is hardcoded to be associated with read requests. Similarly, the "threshold" of "one" that is associated with write requests is predetermined (not programmably selected) by the fact that only one write request can gain exclusive access to a shared resource at once. For the additional reason that Taylor does not teach programmably associating request types with thresholds, Claim 12 is allowable over this rejection.

Claim 13 describes the aspect wherein at least one of the thresholds is associated with a subset of the request types that are associated with another threshold. For example, in Applicants' Figure 3, Threshold 2 is associated with

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request types X and Y, which is a subset of the request types X, Y, and Z that are associated with another threshold, Threshold 1. This aspect of Applicants' invention is not taught by Taylor, which teaches read requests being associated with the threshold specified by the allowed readers field 96, and write requests being associated with the "threshold" of "one".

Independent Claim 14 has been amended to include aspects similar to those discussed above in regards to Claim 1. In particular, step a.) describes that at least one type of request is associated with multiple ones of the defined thresholds. This aspect is shown in Applicants' Figure 3, as discussed above. For at least the reasons discussed above in regards to Claim 1, this Claim is allowable over Taylor.

Claims 15 – 23 depend from Claim 14 and are allowable for at least the reasons discussed in regards to Claims 1 and 14. These Claims include additional aspects not taught or suggested by Taylor as follows.

Claim 15 describes the aspect wherein the thresholds are programmably selected. For reasons similar to those discussed in regards to Claim 11 above, this is not taught by Taylor, and Claim 15 is therefore allowable for this additional reason.

Claim 16 describes the aspect wherein thresholds are programmably associated with the request types. For reasons similar to those discussed in regards to Claim 12 above, this is not taught by Taylor, and Claim 16 is therefore allowable for this additional reason.

Claim 18 describes retrying requests only for predetermined types of requests, which is not taught by Taylor for reasons discussed in regards to Claim 9. For this additional reason, Claim 18 is allowable over this rejection.

Claim 19 relates to processing a request even if each threshold associated with that request has been reached if that request is submitted by a requester that has previously received a retry response. This is not taught by Taylor, as discussed above in regards to 4.

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Claim 20 depends from Claim 19, and further recites using a rotational priority scheme to select a requester that has been issued a retry indication so that this selected requester may gain access to the resource. As discussed above in regards to Claims 4-8, this is not taught by Taylor.

Claim 21 describes the types of requests that are associated with thresholds as being selected from read, write, retry, and high-priority read requests. This is not taught by Taylor, which, at most, discloses "thresholds" associated with only read and write requests.

Claims 22 describe the additional aspect of associating all request types with a first threshold, a second threshold with a first sub-set of all request types, and a third threshold with a sub-set of the first sub-set. This is shown in Applicants' Figure 3, for instance. This is not taught by Taylor, which describes having a "read threshold" associated with a "read" type of requests, and a "write threshold" of "one" being associated with a "write" type of requests.

Claim 23 describes the feature wherein an indication is provided to requesters to stop issuing requests if all of the thresholds have been reached. This is not taught by Taylor.

Turning next to independent Claim 24, this Claim has been amended to describe one or more storage devices each to store a threshold value. At least one type of request is associated with multiple thresholds. As previously discussed, this is not taught by Taylor, and this Claim is therefore allowable as presently presented.

Claim 24 further describes live-lock logic that elevates the status of a request that is of a type associated with one or more threshold values, thereby allowing the request to gain expedited access to the shared resource. The Examiner takes Official Notice that the live-lock logic recited in the Claim is known in the art, and makes reference to the other art that has been made of record, but not relied upon. After reviewing this other art, Applicants' Representative disagrees and respectfully requests that in the event this

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rejection is maintained, the Examiner provides a specific citation to support this assertion.

Claims 25-32 depend from Claim 24 and are allowable for the reasons discussed in regards to Claim 24. These Claims include additional aspects of Applicants' invention not taught by Taylor. For example, Claim 26 describes the live-lock logic as including a storage device that tracks each requester issued a retry indication. For reasons similar to those discussed above in regards to Claim 3 et seq., this type of tracking of requesters that have received retry indications is not taught by Taylor. Claim 26 further describes logic that elevates a retried request so that it may gain access to the shared resource even if all threshold values with which it is associated have been reached. For reasons similar to those discussed in regards to Claim 19, this is not taught by Taylor. Thus, for at least these additional reasons, Claim 26 is allowable over Taylor.

Claims 27 and 28 depend from Claim 26 and are allowable for at least the reasons discussed in regards to the independent Claims, and to Claim 26.

Claim 29 describes one or more storage devices (e.g., devices 322, 324, 326 of Figure 3) to store an indication of the types of requests that are associated with the threshold values. As described in regards to Claim 12, this is not taught by Taylor.

Claim 30 recites a programming interface to programmably select the request types and the thresholds. This is not taught by Taylor, as described in regards to Claims 15 and 16 above.

Independent Claim 31 describes aspects similar to Claims 1, 14, and 24, and is allowable over Taylor for at least the reasons discussed above in regards to those Claims.

Claim 32 depends from Claim 31 and is allowable for at least the reasons discussed in regards to Claim 31. Claim 32 further describes the live-lock means for elevating the status of a request to allow it to gain access to requested resources regardless of whether the request is of a type that is only associated

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with threshold values that have been met. As discussed above, Taylor does not teach this aspect of the invention. Moreover, Applicants' Representative disagrees with the Examiner's taking of Official Notice, and respectfully requests production of a reference in regards to this aspect if this rejection is maintained. For this additional reason, Claim 32 is allowable over Taylor.


To summarize the foregoing, it is believed that this response overcomes all rejections raised in the Office Action. It is therefore requested that those rejections be withdrawn, and a Notice of Allowance be issued in the subject case.

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Conclusion

This amendment is filed in response to an Office Action mailed 9/9/2005. In this Office Action, Claims 1-32 were rejected. Claims 1-32 remain pending. In the amendment set forth above, Claims 1, 2, 4-6, 8, 10, 14, 24, and 31 are amended, and the remaining Claims are as previously presented. In view of the amendments to the Claims and the comments set forth above, it is respectfully submitted that the Claims are in condition for allowance, and a Notice of Allowance is therefore respectfully requested. If the Examiner has questions or comments regarding any of the foregoing, a call to the undersigned is encouraged and welcomed.

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